IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	§	
Plaintiff,	§	CASE NO. 05-CV-329-GKF-SAJ
V.	§	
TYSON FOODS, TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB-VANTRESS, INC., AVIAGEN, INC., CAL-MAINE FOODS, INC., CAL-MAINE FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTS, LLC, GEORGE'S, INC., GEORGE'S FARMS, INC., PETERSON FARMS, INC., SIMMONS FOODS, INC. AND WILLOWBROOK FOODS, INC.	§	
Defendants.		

AFFIDAVIT OF GORDON V. JOHNSON, Ph.D

The undersigned, Gordon V. Johnson, does solemnly swear and state:

1. I grew up and lived on a small diversified farm in North Dakota until attending North Dakota State University, where I received a B.S. in agriculture majoring in Soil Science in 1963. I received a M.S. in Soil Science from the

EXHIBIT 14

University of Nevada (Reno) in 1966 and a Ph. D in Soil Science from the University of Nebraska in 1969. From 1969 to 1977 I taught undergraduate and graduate classes, and conducted laboratory and field research in nutrient management at The University of Arizona. From 1977 to my retirement in 2004 I served as State Specialist in nutrient management for the Cooperative Extension Service at Oklahoma State University. In this capacity I provided educational programs in nutrient management to OSU County Extension Agents and Area Specialized Agents in Agronomy, and to State, District and Field technical staff of the Natural Resource Conservation Service (NRCS). I also developed, taught, and provided the exams for the statewide Nutrient Management Certification program for NRCS and for the Certified Crop Advisory program for Oklahoma. I have served in many regional and national professional organizations, received numerous achievement awards and published over 100 journal articles and fact sheets on nutrient management. From 1977 to 1990 I served as Director of the Soil, Water, and Forage Analytical Laboratories at OSU. I retired from OSU as Regents Professor of Soil Science and retain Emeriti status.

2. I have been retained by the Oklahoma Attorney General's office to evaluate the agronomic reasonableness of poultry litter application to land in the Illinois River Watershed (IRW). Agricultural practices are considered "agronomic" if the practices are essential to effective and economic soil management and crop production. As a result of my study, research, and

teaching of nutrient management for agronomic crops, I am familiar with the soils and crops in the Illinois River Watershed. I have presented educational programs on nutrient management to land owners and operators of farms in the Illinois River Watershed and I am familiar with their practice of application of poultry litter to pasture and hay (forage) fields.

3. The management of nutrients for agronomic production developed as farmers and soil scientists observed that crop yield could be maintained in intensively cropped fields with the addition of fertilizer. Early fertilizer materials included animal manure, rock phosphate, wood ashes, and various forms of mined nitrates. The amounts of these materials applied to a given field depended upon the cost and availability of the materials. Use of these fertilizers was also influenced by the anticipated increase in crop yields. Therefore, interest grew in developing technology that could explain how much phosphorous (P) should be applied to a field to gain the maximum crop yield at the least cost. The development of Soil Test Phosphorus procedures (STP) and their correlation with crop yield provide the answer to that question.

4. Soils typically contain forms of organic and inorganic P in amounts ranging from about 200 to 6,000 lb/acre. As they grow plants absorb inorganic water soluble P from the soil. As plants absorb water soluble P in the soil it is replenished by chemical transformation of less soluble forms of P in the soil to water soluble forms.

5. Neither soil analysis evaluating water soluble P nor soil analysis evaluating total soil P accurately predicted a crop's P need for maximum crop yield. Instead, chemical extractants were developed that successfully mimicked plant use of P. Using these extractants a relationship was developed between P extraction amounts (soil test P, or "STP") and crop yield. This relationship is called soil test correlation. Finally, the STP results were related to crop yield response from fertilizer P addition through field experiments performed on farmer's fields and at OSU Agricultural Experiment Stations. The result of this work is that the tests are calibrated, and we know that an STP of 65 provides a maximum benefit of 100% P sufficiency for efficient forage crop production of bermudagrass and fescue and an STP of 40 provides 95% yield sufficiency for these crops.

6. These correlation-calibration P relationships that establish good agronomic use of P as a fertilizer have been published by the Oklahoma State University in "OSU Fact Sheets" that include tables showing the relationship and the need, if any, for additional P as a fertilizer to accomplish maximum crop yield. These publications include a table showing the categorization of soil test results and identify a STP value of 65 as being adequate , i.e., any additional input of P fertilizer would have no agronomic benefit. This calibration was originally published in 1965 and has been verified by field research through time. The following tables are reproductions of the tables that are in the current

OSU fact sheet widely used for nutrient management and soil test interpretation (OSU Fact Sheet 2225):

Calibration for fescue:

PHOSPHORUS REQUIREMENT		
Soil Test P (STP)	COOL SEASON GRASSES BROME, ORCHARD, FESCUE	Fertilizer P_2O_5
Lbs/A	Percent Sufficiency	Lbs/A
0	30	80
10	50	60
20	70	40
40	**95**	**30**
65+	**100**	**none**

Calibration for bermudagrass:

PHOSPHORUS REQUIREMENT		
Soil Test P (STP)	BERMUDA	Fertilizer P_2O_5
Lbs/A	Percent Sufficiency	Lbs/A
0	50	75
10	65	60
20	80	40
40	**95**	**20**
65+	**100**	**none**

These tables show the relationship between soil test P (STP) values (in the range of 0-65 lb P/acre), the percent sufficiency of maximum crop yield associated with an STP value, and the amount of P fertilizer that could be

applied at an agronomically reasonable rate. These long standing evaluations show that additional P fertilizer is not needed when the STP is greater than 65. The tables also show that when the STP is moderately deficient (STP of 40) there is only a 5% loss in crop yield and that an input of only 20 to 30 lb/acre of P_2O_5 would correct the 5% deficiency.

7. I have evaluated available information to determine if I can form an opinion on the agronomic P needs In the Illinois River Watershed using the STP correlations discussed above. Approximately 95 % of the IRW agricultural land is fescue and bermudagrass forages which are used for pasture and hay production. For these crops an STP value of 65 produces the maximum crop yield. Therefore, application of P to fields where soils are at or above an STP of 65 is not an agronomically reasonable practice. If the STP levels in IRW soils reach this maximum agronomic level, then the Watershed would not reasonably require additional P inputs from poultry litter.

(a) I have reviewed the STP results from a Court supervised project in the Eucha-Spavinaw watershed in Eastern Oklahoma and Western Arkansas. These soil tests were performed as a prerequisite to land application of poultry litter. These test results would be typical for fields where poultry litter application occurs in Oklahoma and Arkansas. As such, they reflect STP for pasture soils in the IRW because of the similarity of land use, poultry operation and soil types in these contiguous watersheds. Of 458 observations in

Arkansas, 440 (96%) had STP values in excess of 65 lb/acre and only 7 (1.5%) had values less than 40. The average STP concentration for Arkansas samples was almost five times the agronomically reasonable STP of 65. For the 227 samples from Oklahoma, 81 % had STP values greater than 65 and 91 % of the samples were greater than 40. The average STP was 2.3 times the agronomically reasonable STP of 65.

(b) A second data set of STP values for IRW soils from Defendants Georges and Tyson show that for the period 2000 – 2005 the average STP for 401 observations was 336, and 88 % of the samples tested had STP greater than 65 and only 6 % of the samples had an STP less than 40. The upper 25% of these samples had an average STP of 740. Additionally, many of these soil test results also reported high available N, indicating a long practice of excess N and P input to these soils. Application of poultry litter sufficient to raise STP and available N to these levels is not a reasonable agronomic practice. Rather it indicates that such poultry litter application was disposal of waste. (Background or naturally occurring STP for these soils would average less than 65.)

(c) I have also examined results of soil tests from the public soil testing labs at the University of Arkansas and Oklahoma State University for the last three years from counties within which the IRW resides (Benton and Washington counties in Arkansas and Adair, Cherokee, Delaware and Sequoyah counties in Oklahoma). These samples represent all samples collected within each county

from fields identified for forage production. Therefore this collection of samples would be expected to include fields that have historically had P input from poultry litter and those with historic input of P from commercial fertilizer. Commercial fertilizer is likely used when fields are not close to a source of poultry litter. Because commercial fertilizer-P is more costly than litter-P, farmers generally do not apply more than will be beneficial for the crop and STP values are generally maintained near 65. To the extent commercial fertilizer is used instead of poultry litter-P in these counties, the county average STP will be less than what is reported for fields receiving poultry litter-P (paragraphs (a) and (b) above). Nevertheless, even for these county-wide results, 90 % of the 4686 samples from Arkansas counties had STP values in excess of 65 lb/acre, and 96 % had values greater than 40 lb/acre (the 95% crop yield sufficiency level). Results from the Oklahoma counties showed that of 4,237 samples, 43 % had values greater than 65 and 57 % had values greater than 40 lb/acre.

(d) The Arkansas legislature recently passed new laws that went into effect on January 1, 2006. These laws require STP analysis before poultry litter can be land applied. The effect of this legislation became evident in review of soil test results for Benton and Washington counties. From 2000 to 2005, the average number of soil samples tested each year, associated with forage production, was 299 and 223 for Benton and Washington counties, and the average STP values were 174 and 140, respectively. The total number of samples increased dramatically in 2006, to1656 for Benton County and 1616 for

Washington County. The respective STP values also greatly increased and averaged 879 and 793 respectively. Phosphorus deficiency (i.e., less than 65 STP) was indicated for only 1.7 % of the samples for Benton County and 3.5 % of the samples for Washington County. Although the results for 2006 still include results for samples outside of the IRW and samples where commercial fertilizer is the source of nutrients, the dramatic change in number of samples is a result of newly required tests where poultry litter has been, and was intended to be, applied. The dramatic increase in average STP values, which are more than 10 times the adequate level for crops, is a clear indication excessive poultry litter P has been applied in the past and fertilizer P is no longer needed for these fields.

(e) I have also reviewed recent studies by the USDA that have examined the capacity of counties to assimilate nutrients from animal manure. Using animal census data from 1982 and 1997 these USDA studies have shown that nationally over 50 % of the on-farm excess N and P is from poultry production. An estimated 92 % of the animal manure produced and land applied in the IRW is poultry litter. Using 1997 data, the USDA concluded categorically that between 75 -100 % of the on-farm N and P from animal manure generated in Washington and Benton Counties in Arkansas and Delaware County in Oklahoma was in excess of the farms' ability to reasonably assimilate the nutrients as fertilizer. Adair, Cherokee and Sequoyah counties in Oklahoma were categorized as 50 – 75 % in excess of the farms' ability to agronomically

assimilate the nutrients. This 1997 "excess" of these nutrients is now likely to have become even greater because poultry production has increased since 1997 and IRW soils have become more nutrient saturated. The government studies did not consider available soil nutrients identified by current soil tests.

8. Based upon my review of the above of STP values, it is clear that land application of poultry litter has led to excessive P build-up in land within the IRW. The need for additional widespread land application of poultry litter as a P fertilizer does not exist. Almost all continued land application of poultry litter within the IRW should be judged as a waste disposal practice rather than fertilization. Given the low percentage of fields with STP values less than 65 and the large amount of litter produced in the IRW, almost all of the litter should be transported out of the watershed. Very few forage fields in the IRW would reasonably require additional application of poultry litter under good agronomic practices.

9. Amending soils is a practice where materials are added to soils to correct conditions that have been identified as limiting normal soil productivity. Under State law, only materials that are proven to correct these limiting conditions may be licensed as soil amendments. Unmanipulated animal manures are specifically excluded from the definition of soil amendments (Oklahoma Soil Amendment Act). Additionally, to be effective, soil amendments must typically be incorporated into the soil by tilling. Land application of poultry litter in the

IRW involves only surface spreading without tilling. Consequently, land application of litter in the watershed does not qualify as a soil amending practice and it is unlikely that significant non-fertilizer benefits could be obtained.

10. Given the forgoing evaluation, land application of poultry litter in the IRW has not been and would not be, for all but a few cases, an agronomically reasonable practice from a P nutrient or soil amendment perspective. Consequently, such practices have been and would continue to be poultry litter disposal rather than fertilization or amendment.

FURTHER AFFIANT SAYETH NOT.

Gordon V. Johnson

Gordon V. Johnson

Subscribed and sworn to me by Gordon V. Johnson on the 8 day of October, 2007.

Signature

Jodi A. Deer

Printed Name

Notary Public, Payne County, Oklahoma

My Commission Expires: 2/24/2010

OFFICIAL SEAL
JODI A. DEER
NOTARY PUBLIC OKLAHOMA
PAYNE COUNTY
COMM. EXP. 02-24-2010
COMM. NO. 02000555